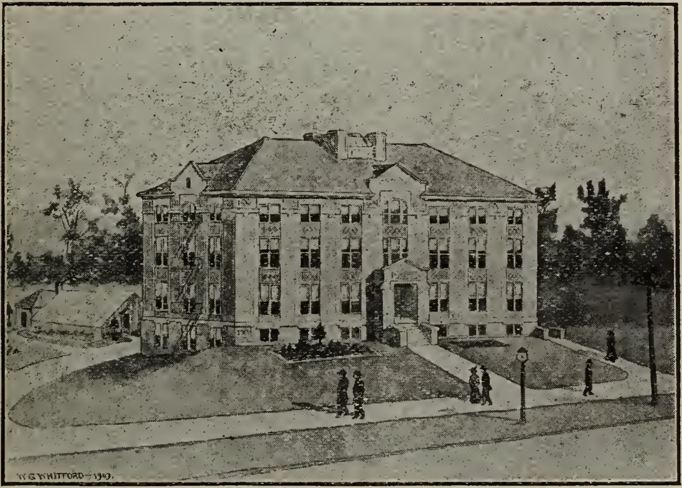
C
al 282 a I
1910-11

UNIVERSITY PUBLICATIONS SEVENTY-FOURTH YEAR—NO. 4

SECOND ANNUAL ANNOUNCEMENT
OF THE
NEW YORK STATE SCHOOL OF AGRICULTURE


W. G. WHITFORD—1909.

At Alfred University, Alfred, N. Y.

For School Year 1910-1911

PUBLISHED BI-MONTHLY BY ALFRED UNIVERSITY
APRIL, 1910
Entered January 25, 1902, as second-class matter, Post Office, Alfred, N. Y.
Under Act of Congress of July 16, 1894

Board of Managers

Boothe C. Davis, Ph. D., President,	Alfred, N. Y.
Elwood E. Hamilton, Secretary,	Alfred, N. Y.
William H. Crandall,	Alfred, N. Y.
D. Sherman Burdick,	Alfred, N. Y.
Vernon A. Baggs,	Alfred, N. Y.
Judge Peter B. McLennan,	Syracuse, N. Y.
Dr. Daniel Lewis,	New York City.
John J. Merrill,	Albany, N. Y.
Charles Stillman,	Alfred, N. Y.
Charles C. Chipman,	New York City.
Frank Sullivan Smith,	New York City.

Ex-Officio Members

R. A. Pearson, State Commissioner of Agriculture.
L. H. Bailey, Director of the State College of Agriculture.
F. N. Godfrey, Master of State Grange.

Executive Committee

Boothe C. Davis, Ph. D., President,
Elwood E. Hamilton, Secretary,
William H. Crandall,
V. A. Baggs,
D. S. Burdick,
Charles Stillman.

School Faculty

BOOTHE C. DAVIS, Ph. D., President,
Rural Sociology and Ethics.

O. S. MORGAN, Ph. D., Director,
Horticulture

W. TRUMAN CRANDALL, B. S.
Animal Husbandry.

MISS ANGELINE WOOD,
Domestic Science and Arts.

JOHN M. MCLENNAN, Ph. M.,
Superintendent of State School Farm.

LINTON B. CRANDALL, S. B.,
Drafting and Shopwork.

DAVID H. CHILDS, S. B.,
Chemistry

JAMES D. BENNEHOFF, S. M.,
Botany and Zoology.

C. O. DUBOIS, B. S.,
Farm Mathematics and Field Crops.

Several instructors have not yet been chosen as this catalog goes to press.

Table of Contents

Page

Introductory Word 6

Factors in Feeding 7

Succulent Feeds 10

How to Raise Calves 12

Winter Dairying 14

The Boarder Cow 16

Bovine Tuberculosis 18

Prepotent and Pure Bred Sire 23

Barnyard Manure 24

Opportunities Offered by the State School of Agriculture 28

Course of Study 29

Special Features of the School 30

Application Blank for Admission 31

Problems in Dairy Management

W. TRUMAN CRANDALL JOHN M. McLENNAN

INTRODUCTORY WORD

In order to reach the highest efficiency in herd management and to secure the largest possible profit from his herd, the dairyman must fulfill the following requirements:

1. Calves must be properly treated and nourished from birth to maturity.
2. The herd must at all times receive the proper kinds and amounts of feed.
3. The milk or milk products must be disposed of advantageously.
4. Boarder or unprofitable cows must be eliminated from the herd.
5. The herd must be kept in health and free from disease.
6. A prepotent and pure bred sire must head the herd.
7. The by-products of the dairy should be managed in the light of recently discovered scientific knowledge.

It is evident, from an impartial survey of the dairy situation in Southwestern New York, that the above requirements are greatly neglected in the majority of dairies, much to the detriment of successful and profitable dairying.

Because of these facts it has seemed proper to devote space in this announcement to brief discussions of the more important problems concerned in profitable dairying. An attempt has been made, in what follows, to set forth clearly and concisely the various factors in such subjects as affect the dairymen most vitally.

FACTORS IN FEEDING

The problem involved in the proper feeding of animals under all conditions is a difficult one and requires a careful and understanding consideration of all the factors concerned. This discussion will undertake to mention and briefly discuss in the order of their importance, the different factors to be considered in the formulation of a ration. These are of such importance that the feeder cannot hope to succeed without heeding them, in the compounding of his feeds.

Following are the five prime factors and basic principles of feeding.

1. Species

In feeding we must realize that there is a difference in the digestive systems of the various species of animals, and moreover we must know what those differences are in order to feed feeds which are properly adapted to each system. The table given below gives the most important differences.

*Length of intestines and capacity of stomachs of farm animals.

Animal	Capacity of Stomach and Intestines	Capacity of Stomach	Length of Intestines
Horse	223.8 quarts	19 quarts	98.1 feet
Ox	376.7	266.9	187.2
Sheep	46.7	31.3	107.3
Hog	29.0	8 5	77.1

From the above we can easily see why a horse cannot use as much or as bulky food as can the cow; and why a hog should have a sloppy rather than a bulky food.

2. Physological Demands.

The kind and amount of food allowed an animal must depend also upon the kind of work it is doing. A cow that is giving a large amount of milk requires a sufficient quantity of proper food, from which to produce it. On the other hand a heifer requires food suitable for the formation of bone and flesh and enough to ensure proper growth. A horse that is worked constantly must be fed differently in amount and kind than the horse that is used but little.

Under this head must come the discussion of the various nutrients in feeds. The main divisions of these are protein, carbohydrates, and fats. It is essential to know the functions which these different nutrients have in the animal; and also to know the amounts in which they occur in the feeds used.

Protein is composed of carbon, hydrogen, oxygen, nitrogen and sulphur. It is absolutely necessary to the formation of bone, flesh, hair and hoof. This explains why a young growing animal needs a larger percentage of protein in its ration than does a mature animal. Heat, energy and body fat may be produced by protein, but it is an expensive source, because it is the costliest nutrient in feeds and the nitrogen which makes it so, does not assist in heat or energy production. Before protein will produce heat or energy it must be broken down, and in this process the nitrogen is wasted and certain organs overtaxed in accomplishing its disposal.

Carbohydrates are a combination of carbon, oxygen and hydrogen, all of

---

*Feeds and Feeding, by Henry

which can be obtained from the air and water. It is therefore the cheapest of nutrients. Its function is to furnish heat to the body, and energy for all work and motion. Energy is used in all the processes of the body, as heart and lung action and digestion, as well as in the production of milk, labor and flesh. Carbohydrates in excess of that needed for heat and energy are laid onto the body in the form of body fat. This fat, when the food is insufficient to supply the needed heat and energy, is broken down and used for that purpose.

Fats are composed of the same elements as are carbohydrates, but they are combined differently and are more efficient in the production of heat, energy and body fat. One pound of digestible fat will produce as much energy as will two and one quarter pounds of digestible carbohydrates.

It has been learned by experiments that different animals of different species, doing different work, require different amounts and proportions of these nutrients. In other words the nutritive ratio of their ration should differ. By nutritive ratio we mean the amount of carbohydrates and fat compared with the amount of protein. To obtain the nutritive ratio of any ration, multiply the digestible fat it contains by 2.25, add the product to the amount of digestible carboyhdrates and divide the result by the amount of digestible protein.

Feeding standards have been evolved, showing as nearly as can be shown, what amounts and proportions of nutrients different animals under different conditions should receive. This cannot be followed blindly, but must be used with reason, and varied to meet the needs of individual animals and varying circumstances. The few given below are known as the Wolf-Lehmann Feeding Standards, and are given as a guide to feeding and not as a rule to be invariably followed. The successful feeder must know each animal under his care and its requirements, and he must feed and care for it according to the dictates of that knowledge.

FEEDING STANDARDS

Animal		Per day per 1,000 pounds live weight				
			Digestible Nutrients			
		Dry Matter	Protein	Carbohydrates	Fat	Nutritive Ratio 1: *
Milch Cows when yielding daily						
11.0 pounds of milk		25	1.6	10.0	0.3	6.7
16.6 pounds of milk		27	2.0	11.0	0.4	6 0
22.0 pounds of milk		29	2.5	13.0	0.5	5.7
27.5 pounds of milk		32	3.3	13.0	0.8	4.5
Growing Cattle (dairy breeds)						
Age in months	Ave. live wt. per head, lbs.					
2-3	150	23	4.0	13.0	2.0	4.5
3-6	300	24	3.0	12.8	1.0	5.1
6-12	500	27	2 0	12.5	0.5	6.8
12 18	700	26	1.8	12.5	0.4	7.5
18-24	900	26	1.5	12.0	0.3	8.5

* In the column below is the other term of the ratio.

In compounding a balanced ration it is necessary to have on hand a table showing the digestable nutrients of which feeds are composed. First put down the bulky feeds in such amounts as can best be used under existing circumstances. Work out from the table, the amount of each nutrient in each of these feeds. Find what amount of nutrients are needed to make the total amounts as shown in the Standard, and add such concentrates as you wish to feed in such quantities as will make up the total. Such a ration will appear as below.

Ration for dairy cow weighing 1000 lbs. and yielding 22 lbs. of milk daily:

Feeding Stuffs	Dry Matter	Digestible Nutrients			Nutritive ratio
		Protein	Carbohydrates	Fat	
Red clover hay, 8 pounds.........	6.776	.544	2.864	.136	
Corn stover, 10 pounds...........	5.95	.17	3.24	.07	
Oat straw, 3 pounds..............	2.724	.036	1.153	.024	
Corn meal, 5 pounds..............	4.47	.39	3.335	.215	
Bran, 5 pounds	4.405	.61	1.96	.135	
Oil meal, 3 pounds...............	2.724	.879	.981	.21	
Total	27.049	2.629	13 538	.79	1:5:9
Wolf-Lehmann Standard	29.0	2.5	13.0	.50	1:5:7

3. Quality

Feeds have characteristics and qualities which may affect the quality of the flesh or milk it produces. Some effects are good, others bad. These must be known, and any which might produce bad effects should be eliminated from the ration. For instance, turnips, cabbage, onions, and various weeds in the pasture will impart undesirable tastes and odors to milk, if the cow is allowed to eat them. Cotton-seed meal will harden the butter fat and consequently the butter into which it is made; oil meal on the other hand softens the butter fat and butter. These are but a few of many examples which might be given, showing the effect of different feeds on milk and its products.

4. Palatability

Every ration should be palatable; that is, it should be relished by the animal to which it is fed. An animal will eat more of such a ration and do more efficient work on it than it otherwise would. Two things add greatly to the palatability of a ration; variety and succulence in feed. A ration for dairy cows should contain, whenever possible, a feed largely composed of water, as silage, mangels, soiling crops or pasture. Two or more kinds of grain feeds can be more economically fed than can a single one.

5. Practicality

All rations must be practical, even at the sacrifice of other factors. A practical ration is one which when fed, will return a substantial profit above its cost. Under certain circumstances, a balanced ration cannot be profitably fed, because of the extreme cheapness of certain feeds which the feeder may have at hand. This factor must always be considered by the feeder, in the light of his individual conditions.

SUCCULENT FEEDS

Why is it, that the dairy cow will increase her milk flow, the farm horse will regain his health and spirit, the hog will grow, thrive, and fatten and even the hens will increase their production of eggs, when turned out to grow in the spring time? The answer is, they secure succulent food, and balance their ration.

It must be obvious to the most casual observer that succulent food is a desirable, if not an indispensable element in the feed ration of every farm animal, and without it few farm animals can continue to thrive or remain profitable.

Succulence in food, it should be explained, is simply the retention of the natural moisture in the plant, which is intended to make up part of the feed ration, and may be secured in the form of grass and soiling crops in summer, and silage, roots, cabbage or fruit in winter; but whatever its form, it must be wholesome and palatable. The additional water contained in silage as contrasted with dry corn stalks, of grass as compared with dry hay, or of dried beet pulp as compared with freshly cut beets, has no feeding value whatever, except the very important effect of rendering the food more palatable and digestible; and because of this palatability and digestibility the succulent pasture and meadow feeds of summer furnish to the farm animal the most perfect balanced ration known.

But while nature will furnish an abundant supply of succulent food in the spring and summer seasons, the farmer must contrive to keep up the supply during the remainder of the year if he would secure the best results from his dairy and his various other domestic animals. Experience has shown that he can furnish a succulent ration to his dairy cows in the fall and winter months, and thus secure his largest flow of milk when dairy products bring the highest price and heat does not exhaust nor flies torment. In fact, the wonderful official records of milk and butter production of recent years, have all been made in the cooler seasons.

If then it is important for the dairyman to furnish succulent food for his dairy, how may he best secure it?

Laying aside all prejudice in the matter, and judging from scientific experience as well as the experience of hundreds of practical dairymen, one can safely say that there is no form of succulent feed more palatable, more healthful and so cheaply furnished as good corn silage, and one can go a step further and say, that no feed produces, purer or better flavored milk when carefully prepared and properly fed. "Good corn silage," however, means just that and nothing less; it contemplates large, thrifty stalks, carrying large and well developed ears, one on every stalk; it means "cutting in" at the proper time, and storing in a properly constructed, air tight, silo in the most careful manner; and it means a sufficient quantity to furnish every cow thirty pounds every day, from the time the grass gets short in the fall, until it comes fresh in the spring. No dairy farmer in this section of the country can afford to be without a good silo. Extended experiments carried out for the purpose of determining the proper time to harvest a field of corn for silage, clearly demonstrates the fact that the corn should be practically ripe when cut.

In connection with these experiments the absolute weight of dry matter and nutrients was determined in 400 hills of corn cut on different dates and from these data the yields of dry matter and nutrients per acre were calculated. The results were as follows :

Yield per acre of green fodder, dry matter, nutrients :

Time of cutting	Green Fodder Pounds	Dry Matter Pounds	Protein Pounds	Nitrogen-free extract. lbs.	Fat Pounds	Fiber Pounds
Aug. 10, (tasseled)	21,203	3,670.24	472.72	1,828.15	67.90	1,010.05
Aug. 25, (in milk)	25,493	5,320.39	576 08	3,212.45	143.11	1,148.67
Sept. 6, (glazing)	25,865	7,110.29	711.03	4,554.14	199.08	1,294.78
Sept. 15, (ripe)	23,007	8,020.24	696.96	5,356.72	242.61	1,413.17

The gross weight of the crop increased rapidly and regularly up to the time of glazing. After that period the change was mainly in the displacement of water by dry matter.

From the tasseling of the corn to the time when the ears were in the early roasting stage, there was a gain of 44 per cent. in dry matter; from the roasting stage to the time of glazing, there was a further increase of 33 per cent., and from this stage to maturity a further gain of 12 per cent. The protein, nitrogen-free extract and fat also increase very rapidly up to the time of maturity. It is plain then that the farmer may add very materially to the feeding value of his silage by planting his corn early and thoroughly ripening his crop The cost should not exceed $2 per ton.

Next in importance after silage for succulency in the dairy ration comes the root crop. While the feeding content in the ordinary root crop is rather low if one judges by the strict analysis given in the feeding standards, nevertheless, they are relished so much by the cattle, their effect seems to be so beneficial to the health, and they assimulate the other foods so perfectly in the digestive organs, that their feeding value is very much greater than the percentage stated in feeding standards, and leads one to think the secret is succulency and palatability.

For the dairyman's use, probably the best root crop to raise is the mangel wurzel beet, because of the tremendous tonage which can be produced upon an acre, —1000 bushels at least—and the further fact that the plant grows well up out of the ground, hence is easily and cheaply handled. It is also a perfect keeper and will remain fresh and crisp until the following spring. While the cost of raising a crop of beets, ton for ton, is larger than for silage, still it should be produced for $3.50 per ton and thirty or forty tons per acre is not an uncommon yield.

Turnips may be easily and cheaply raised and large quantities secured by sowing the seed along the rows between the hills of corn. For early winter feeding they do very well for a succulent ration if fed moderately, but fed in large quantities they are apt to affect the flavor of the milk. They are excellent for sheep, but do not keep well for late winter or spring feeding.

Cabbage make a very satisfactory succulent ration for the dairy and will increase the flow of milk while fed, but it is not believed that this crop can be raised to advantage for that purpose alone. The crop is too expensive, it requires too much room for storage, and the tonage per acre is not generally so satisfactory as either silage or mangel wurzel beets. If raised, however, with the purpose of selling when the market is good and feeding when the price is low, the crop will return a fair profit, one year with another.

But above all the questions which confront the dairyman is the item of expense. Can he afford to furnish a succulent ration to his dairy, and will he receive a suitable return? The experience of the writer convinces him that the dairyman can afford to do nothing else.

To illustrate, here is a home-made balanced ration for a day per cow giving 20 pounds of milk:

	Dry Matter Pounds	Protein Pounds	Carbohydrates and fat. Pounds
20 lbs. clover	16.94	1.476	8.444
30 lbs. corn silage	7 68	.363	5.962
30 lbs. mangels	2.73	.309	1.769
2 lbs. buckwheat middlings	1.764	.446	1.002
	29.114	2.594	16.177

With clover valued at $14, silage at $2, beets at $4, and buckwheat middlings at $20 per ton, this ration would cost twenty-five cents.

If no mangels are raised and no silo used, the ration, in order to be of the same feeding value might be made up as follows:

15 lbs. clover at $14 per ton	$ .14
10 lbs. corn fodder at $10 per ton	.05
3 lbs. corn meal at $30 per ton	.045
3 lbs. wheat bran at $26 per ton	.039
2 lbs. gluten meal at $32 per ton	.032
Total	$ .271

In feeding the purchased ration there is a direct loss of over two cents for each cow fed, but a much greater loss is sure to follow in denying them the succulent food so necessary to secure good health, good digestion and a continuous flow of milk during the winter months. And worst of all, it takes the larger part of the milk check to pay the feed-man at the end of the month.

To sum up the whole matter, the business of the dairyman is to manufacture raw material into some form of dairy product. The cow is the machine which he employs to do that work. In order to succeed well he must produce his own raw material upon his own premises, thus following the example of other successful manufacturers. At present prices of grain and dairy products, he cannot afford to buy western grain to make eastern milk. Every consideration demands that the dairyman shall furnish his own dairy ration, and furnish it in the most succulent form. His animals require it for health, his business demands it for profit, and he will see in it one of the principal factors of his success.

HOW TO RAISE CALVES

If it is true in a sociological sense, that "the boy is the father of the man," it is equally true in an agricultural sense, that "the calf is the mother of the cow."

The best specimens of dairy cows, as we see them today, are the result, not only of intelligent breeding, coupled with wise feeding and full development of the calf itself until grown to maturity, but also of careful treatment of the dam before the calf is born. Good breeding, while in every way desirable, is still important to produce good cows if the proper feeding and development of the calf is neglected. Nor is that all; the real development of the calf begins long before its birth and is dependent upon the feed furnished and care bestowed upon the dam. In short, a well fed and well treated cow will bring into the world, a strong, well grown calf and do her part well toward starting the career of the future improved dairy cow. If now the calf were allowed to develop in nature's way and bask under the fostering care of the dam, what a beautiful, playful, bright-eyed creature she would become. She thrives so long as she runs with the dam because she receives pure milk, which contains just the proper food properties, and at just the proper temperature to suit the delicate stomach, and all the necessary material for good physical development are furnished for the rapidly growing body.

But the commercial necessities of our own dairy system requires that she shall be "weaned" and relegated to the tender care of the farmer or hired man, who undertakes to perform the duties of wet nurse, and at this point the trouble begins. The calf is usually fed twice a day, after the milking is done, with milk which has become chilled, from pails seldom or never washed, reeking with germs, and vile with decaying matter. Sometimes the milk is fresh and sometimes sour, and generally the quantity fed is altogether out of proportion to the needs of the calf. The results are what might be expected, the calf scours, the hair becomes rough, the eyes dull, she stops growing and becomes a pot-bellied, stunted, forlorn object.

Now all this can be avoided by just a little attention to details, and these are here enumerated in the order of their importance :

(1) Feed the calf from clean dishes, always washing them in boiling water immediately after each feed.

(2) Whether feeding whole milk, skimmed milk or warm milk, be sure the temperature of the liquid is approximately 93 F. degrees.

(3) Never feed a young calf more than three quarts at one time; if she seems to require more, feed three times a day.

(4) When ten days old, mix a ration composed of 2 parts ground oats, 2 parts wheat bran, 1 part oil meal and 1 part corn meal, and put a handful in a clean box fastened to the side of the stall, so that she can readily reach it. After she drinks her milk she will want to suck the hand; lead her to the box and teach her to eat the ration. Put only so much feed in the box as she will eat clean after each feed.

(5) Give her a small amount of fresh clover or alfalfa every day.

(6) If necessary to change from whole milk to skimmed, it may be done when the calf is fifteen days old, but the change should take place gradually, substituting but a pint of skimmed milk in place of a pint of whole milk at each feeding until the change is complete.

(7) When the calf is a month old it may be desirable to substitute warm water for the skimmed milk. This may be accomplished in the same way, if the temperature is maintained the same, and the calf will continue to thrive provided she is eating the feed ration properly, and is furnished all she can eat.

(8) Keep the stall clean, well bedded, well lighted and ventilated.

(9) Keep a supply of salt in the stall and plenty of clean water when old enough to enjoy them.

A calf so treated will be chewing the cud at twelve days old, will be bright, healthy and handsome, and should weigh at ten months from 400 to 500 pounds, and if her development continues as it should, she will become the leading cow in the dairy.

WINTER DAIRYING

One of the problems which every dairyman must decide is whether he shall winter or summer dairy; or in other words, whether he shall produce the bulk of his milk in the winter or in the summer. The solution of this problem lies wholly with each individual and must be decided in accord with the peculiar circumstances and conditions which surround him.

The object of this topic is to point out some very important factors to be considered in the solution of this problem and to urge those who can properly do so, to undertake winter dairying.

Where winter dairying is carried on, the following advantages are had.

1. Profitable work furnished during winter months.

There is, on the farm, during the winter, comparatively little to be done aside from the regular chores. Winter dairying furnishes work during this period, making it possible to profitably employ hired help the year round, thus solving to some extent the labor problem.

2. Largest milk and butter fat yield when prices are highest.

Prices for milk and milk products are invariably higher in the late fall, winter and early spring months, than they are in the summer. The farmer should produce when he can make the largest profit; this, in the majority of cases, will be in the winter.

3. Cows go out to pasture when they are drying off and their milk flow is increased.

Cows in this section are usually turned out to pasture during May. If the cows freshen in late fall they will be on the latter part of their lactation period and consequently their milk flow will be going down more or less rapidly. The effect of changing the cows from winter conditions to summer conditions will invariably stimulate and increase the milk flow and increase materially the yearly production.

4. Cows are milking light.

When, 1st. The farmer has the most to do.

The cows begin to dry off in late spring and summer and do not freshen until the fall plowing is completed or well under way, making it possible to devote more time and attention to the sowing, cultivation, harvesting and threshing of crops, and less to the milking and to the care and marketing of milk.

When, 2nd. Pasture becomes poor.

In average years, during July and August, pastures are short and dry, and not sufficient to properly nourish a heavy milking cow. It will, however, support a light milking or dry cow.

When, 3d. Heat and flies tend to diminish milk flow.

Considerable loss in total production is sustained when a cow but two or three months along in her lactation period, is put under these conditions, because under them she cannot do her best, and after going down she cannot again be brought up to her normal flow. The milk flow of a cow in the last months of her lactation period will be immaterially affected by heat and flies, because she is giving normally but little milk.

5. Better calves can be raised.

Calves dropped in spring must spend the first and most important months of their lives under the adverse conditions of hot weather and flies. If skim milk from the creamery is fed, it will invariably reach the calf slightly soured.

These conditions are overcome by having the calf dropped in the fall when its first months may be spent under more favorable conditions. The temperature is cold, there are no flies, milk will keep sweet much longer and the farmer has more time to give to the proper raising of his calves. This advantage in winter dairying cannot be over estimated, for the calf is the future cow from which the farmer hopes to derive a fair income and if his hopes are to be realized, the calf must be given the very best of care and conditions under which to develop.

6. Breeding operations are simplified.

The bull should never be allowed to run with the herd, yet the temptation to do so and save the trouble of separate maintenance is great. Cows freshening in the fall will come in heat during times when they are confined in the barn or barnyard, when the farmer will be in a position to take greater care and supervision over the breeding operations in his herd.

The whole question of profit hangs on the factor of total production per cow and always will, regardless of the cost of feed and the selling price of milk. The difference being, that the higher the cost of feed, the better must be the cow, in order to yield a fair profit. At this time under present conditions a cow yielding less than 5000 pounds of milk or 250 pounds of butter fat cannot be profitably kept in the herd. Such a cow will yield around 1000 pounds more of milk under the winter than under the summer system, and considering the increase in the value of the milk and milk products in the winter, we may expect from this cow at least $15 more net profit under the winter system. This is considering also the increased cost of winter feeds. A cow yielding less than the above amounts cannot be profitably kept under any conditions, summer or winter.

There are conditions under which winter dairying cannot be practiced, but these will occurr in a minority of cases. It is for the individual to consider fairly his surrounding conditions before deciding one way or the other. Farmers, who have poor barns, inadequate winter water supply and no winter market for milk, must invariably decide on summer dairying until they can overcome those conditions.

The question always arises as to what effect a large winter production of milk will have upon its price. The answer is simple and proven by past experience in large sections where winter dairying is universally practiced. The demand is always, and apparently will be, equal to or greater than the supply, and since price depends on supply and demand, it will remain high. The United States are annually importing $6,000,000 worth of dairy products, proving that we do not supply our own demand. The value of imported dairy products has increased each year in spite of increased local production.

The greatest drawback which must be overcome before winter dairying or any other kind of dairying can be made profitable is that of the poor cow. Success depends upon her elimination from the herd, and the filling of her place with a dairy animal with a profitable production. A discussion of this problem and how to handle it is taken up under the heading of The Boarder Cow.

THE BOARDER COW

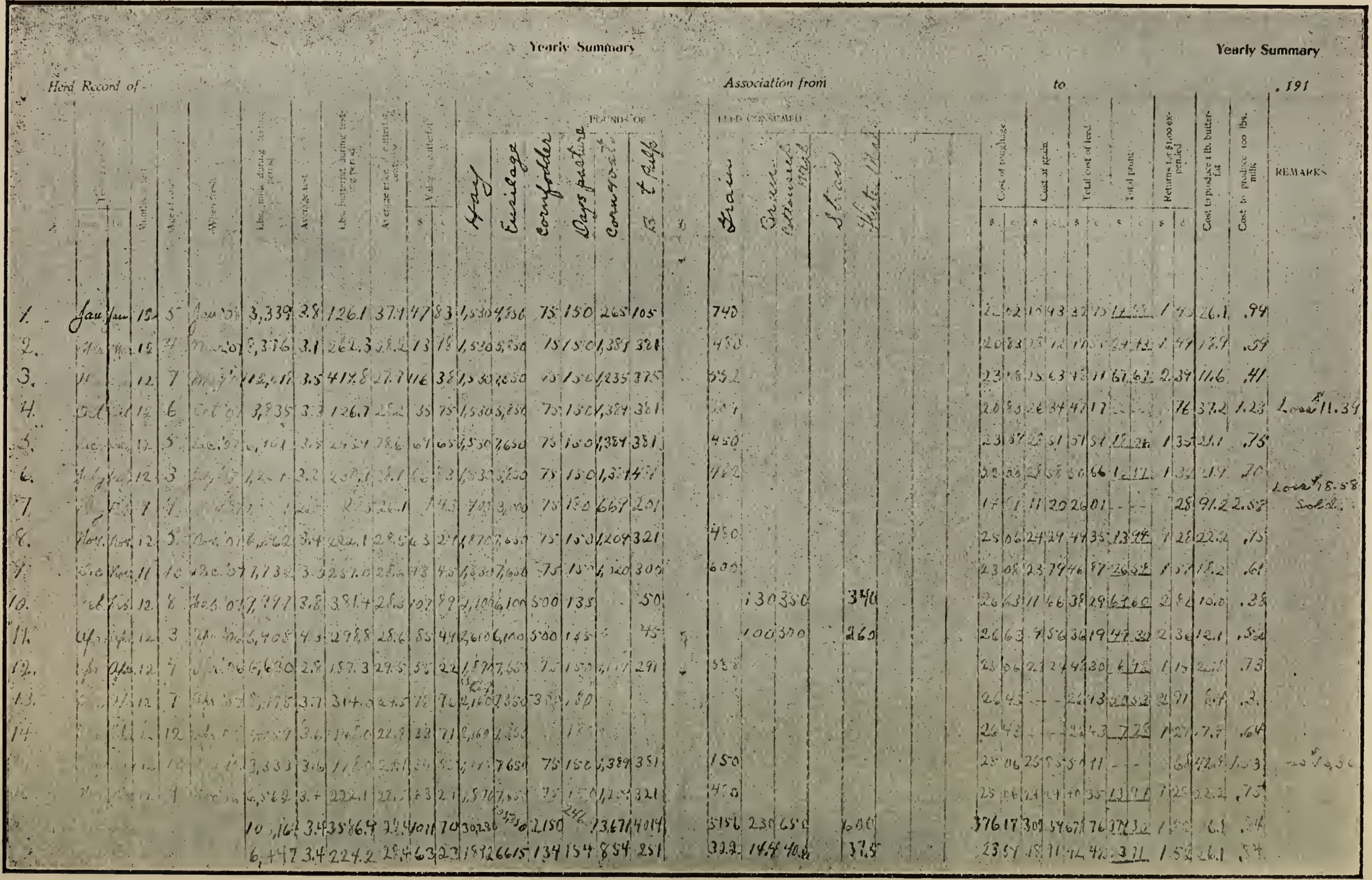
During the past few years the cost of dairy production has greatly increased, due largely to the increased cost of the various factors entering into that production. These increases are approximately as follows: building 20 per cent, cows 75 per cent, feed 50 per cent, and labor 100 per cent. In spite of these large increases affecting the cost of production, the price of dairy products has increased but 30–35 per cent in the same length of time. Under these circumstances it has become a problem for the dairyman to realize a fair profit from his operations, and this problem is becoming more and more acute each year. It is unnecessary to take up the cause of these conditions. How to deal with and overcome them to the dairyman's advantage, is the all important question.

One of two things must be done in solving this problem. Either dairy products must sell for more or the products must be produced cheaper. It seems improbable at this time that any advance in the price of dairy products can be hoped for. So all those who wish to remain in the dairy business, with the intention of making money, must turn to the alternative, or cheaper production. There are several means by which production can be cheapened and it is to a consideration of these means that this discussion will be limited.

Cheaper production may be brought about by one or all of the following: more economical feeding methods, the use of system in planning and carrying out farm and dairy work, and the increase of production per cow. It is in the last that the greatest good may be accomplished, for it is in that detail that a large per cent of our dairies are particularly weak, as shown by the fact that the average yearly production of the cows of New York State is around 4000 pounds of milk and about 150 pounds of butter fat. This is low and far below what should be the standard for production. It is evident that the more milk and butter fat a cow will produce on the same amount of feed, the greater will be the profit derived from her production.

There exists in all herds a difference in the production of the individuals. Some may be extremely profitable, while others are mere "boarders," or those which do not return enough to pay the cost of their board. Such animals, in many cases, not only eat up their own profit but also a part of the profit of the better ones.

The question, then, becomes one of detecting which in the herd are the profitable and which the unprofitable cows, the disposal of the latter and the



Yearly Summary

Herd Record of

Association from to , 191

Yearly Summary

	T[illegible]		Months in test	Age of cow	When fresh	Lbs. milk during testing period	Average test	Lbs. butterfat during testing period	Average price of butterfat, cents	Value of butterfat		Pounds of feed consumed											Cost of roughage		Cost of grain		Total cost of feed		Total profit		Returns for $1.00 expended		Cost to produce 1 lb. butterfat	Cost to produce 100 lbs. milk	REMARKS
										$	c	Hay	Ensilage	Cornfodder	Days pasture	Cornstalks	B. t Pulp	Grain	Bran	Cottonseed Meal	Straw	Glute Meal	$	c	$	c	$	c	$	c	$	c			
1.	Jan	Jun	12	5	Jan '08	3,339	3.8	126.1	37.9	47	83	1,530	4,856	75	150	265	105	740					22	62	15	93	[illegible]	[illegible]	[illegible]	[illegible]	1	[illegible]	26.1	.99	
2.	Mar	Mar	12	4	Mar '07	8,376	3.1	262.3	28.2	73	78	1,530	5,850	75	150	1,381	321	430					20	83	[illegible]	[illegible]	[illegible]	[illegible]	24	13	1	[illegible]	13.9	.39	
3.	[illegible]	[illegible]	12	7	May '07	12,[illegible]	3.5	417.8	27.7	116	38	1,530	7,650	75	150	1,235	375	552					23	[illegible]	25	63	48	[illegible]	67	61	2	39	11.6	.41	
4.	Oct	Oct	12	6	Oct '07	3,835	3.3	126.7	28.2	35	75	1,530	5,850	75	150	1,384	381	[illegible]					20	83	26	34	47	17	[illegible]	[illegible]		76	37.2	1.23	Loss $11.39
5.	Dec	Dec	12	5	Dec '07	[illegible],101	3.5	[illegible]	28.6	67	65	1,530	7,650	75	150	1,384	351	450					23	57	26	31	[illegible]	[illegible]	12	[illegible]	1	35	21.1	.75	
6.	July	July	12	3	July '0[illegible]	[illegible]	3.2	[illegible]	[illegible]	[illegible]	[illegible]	1,530	[illegible]	75	150	1,3[illegible]	4[illegible]	422					22	[illegible]	[illegible]	58	[illegible]	66	[illegible]	17	1	3[illegible]	21.9	.70	
7.	[illegible]	[illegible]	7	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	43	[illegible]	3,[illegible]	75	150	667	201						17	[illegible]	11	20	26	01	—	—		28	91.2	2.5[illegible]	Loss $18.58 Sold.
8.	Nov	Nov	12	5	Nov '07	6,[illegible]62	3.4	222.1	28.5	63	2[illegible]	1,870	7,650	75	150	1,209	321	450					25	06	24	29	49	35	13	94	1	28	22.2	.75	
9.	Dec	Nov	11	10	Dec '07	7,73[illegible]	3.3	257.0	28.[illegible]	73	45	1,530	7,650	75	150	1,120	300	600					23	08	23	79	46	87	26	58	1	5[illegible]	18.2	.61	
10.	Feb	Feb	12	8	Feb '07	7,991	3.8	381.4	28.3	107	99	2,100	6,100	500	135		50		130	350	340		26	63	11	46	38	29	[illegible]	[illegible]	2	8[illegible]	10.0	.38	
11.	Apr	Apr	12	3	Apr [illegible]	6,908	4.3	297.8	28.6	85	44	2,610	6,100	500	135		45		100	300	260		26	63	9	56	36	19	[illegible]	[illegible]	2	36	12.1	.5[illegible]	
12.	Apr	Apr	12	4	[illegible] '06	6,630	2.8	187.3	29.5	55	22	1,597 [illegible]	7,650	75	150	[illegible]	291	558					25	06	22	24	47	30	7	92	1	17	[illegible]	.73	
13.	[illegible]	[illegible]	12	7	[illegible]	8,[illegible]75	3.7	314.[illegible]	24.5	76	76	2,160	7,350	300	180								26	43	—	—	[illegible]	[illegible]	[illegible]	[illegible]	2	91	8.4	.2[illegible]	
14.	[illegible]	[illegible]	12	12	[illegible]	[illegible]	3.6	[illegible]	22.9	33	71	2,160	7,350		135								26	43	—	—	[illegible]	[illegible]	7	28	1	27	7.7	.64	
[illegible]	[illegible]	[illegible]	12	10	[illegible]	3,333	3.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	7,650	75	150	1,389	351	150					25	06	25	[illegible]	[illegible]	11	—	—		[illegible]	[illegible]	1.03	[illegible]
[illegible]	[illegible]	[illegible]	12	4	[illegible]	6,562	3.4	222.1	[illegible]	63	2[illegible]	1,870	7,650	75	150	1,2[illegible]	321	450					25	[illegible]	24	[illegible]	[illegible]	35	13	[illegible]	1	25	22.2	.75	
						10[illegible],16[illegible]	3.4	3586.4	[illegible]	[illegible]011	70	30,28[illegible]	[illegible]	2,150	246	13,671	4,014	5,156	230	650	600		376	17	30[illegible]	[illegible]	[illegible]	76	[illegible]	[illegible]	1	[illegible]	6.1	[illegible]	
						6,447	3.4	224.2	28.4	63	23	1,892	6,615	134	154	854	251	32.2	14.4	40.6	37.5		23	57	18	31	[illegible]	[illegible]	3	11	1	52	26.1	.54	

YEARLY HERD RECORD SHEET

filling of their places with better producers. This can only be done by the frequent weighing and the testing for butter fat of the milk of each cow. Furthermore, the income of each cow must be known, and from that subtracted the cost of the feed consumed, to obtain the net profit. Knowledge of these items is essential to the administration of a dairy on a business basis which is the only basis it should ever be run on. No labor which the dairyman can do will bring in such returns, as that expended in the weighing and testing of each cow's milk monthly, and thus determining her status in the herd, which must be either that of a profitable or a boarder and unprofitable cow.

A large number of dairymen do not feel that they can afford to invest in a Babcock Tester and Scales, or give the time and care necessary for this work. Such men can very profitably co-operate and hire a man to do this for them. Such co-operation is usually manifested in the formation of a Cow Testing Association, with officers, and a board of directors who appoint a tester to do the testing and weighing and to keep all records. The expense is divided among the members pro rata per cow. One man can test monthly 26 herds, and if these herds contain from 400 to 450 cows, the expense can be covered by a fee of one dollar per cow per year. Such an organization may co-operate in many ways to the mutual advantage of its members, as in the buying of feeds, fertilizers, machinery, and pure bred sires, etc.

Members of such an association have monthly records of every cow tested, including all the items shown in the record sheet. (See p. 17.) This sheet shows the yearly records of each cow in a herd of sixteen. The value of such a record is that the boarder cows are plainly indicated and the owner is in a position to dispose of such as he finds he can not profitable keep in his herd; that the effect of different feeds and combinations of feeds upon production are recorded, such records aiding greatly in the establishing of a proper and economical system of feeding; that a reliable record is available whenever a cow is for sale, and such a record, if a good one, will materially increase the price obtainable for that cow; and lastly, but not least, that a helpful spirit of competition is fostered between dairymen and an interest added to dairy operations.

The organization of such an Association is under way in Allegany County, and the Dairy Department of this School will be glad to hear from any dairymen living within or near that County, who are interested in this movement. Write for particulars.

BOVINE TUBERCULOSIS

Bovine Tuberculosis is an insidious disease, one most difficult to handle because of the stealth and slowness with which it developes. A practical knowledge of this disease and the means by which it may be prevented or eliminated from a herd, is of vital importance to every dairyman. What follows is an untechnical discussion of the various phases of the subject, which must appeal to every dairyman who wishes to protect his interests and those of his customers, by producing and selling pure and uninfected milk or milk products.

The prevalence of tuberculosis in this country is estimated, from the work which has been done in tuberculin testing during the past few years, to be around 10 per cent. One per cent. of all cattle slaughtered at the slaughtering centers are reported to be affected. The reason that this per cent. is so low in comparison with the estimated 10 per cent. is because the great majority of slaughtered cattle are from the western plains. About 40 per cent. of the dairy animals shipped in as canners have tuberculosis. This is one of the most important questions before the farmer today and while he is attempting to improve his herd, he must not neglect this side of the problem, or his efforts may result in naught.

We may safely assume that 40 per cent. of all affected animals are in a stage advanced enough to throw off in their feces, milk or saliva, active tuberculosis germs. The milk from one diseased animal will contaminate the milk of the whole herd. Even though the cow does not give the germs directly into the milk, she is sure to do so through her manure or saliva, dried particles of which under ordinary circumstances, float in the air and fall into the milk pail. It is positively known that these germs may exist in skim milk, buttermilk, wholemilk and butter and retain for a long time, their virulence or ability to produce disease.

The relation which these germs hold to the contraction of human tuberculosis is coming to be more and more studied and more and more is being learned about it. It has been known for years that the disease cannot exist without the presence of a germ known as the "tubercle bacillus." But while this is the direct cause, it must have suitable conditions under which to work or it does not develop the disease. These conditions are foul air, lack of sunshine, weakened constitution or an inherited predisposition to tuberculosis. These germs are so prevalent in the dust, air and food that few people escape the disease though unconscious of it and few die from it. One German doctor in examining 1500 human bodies found 91 per cent to show tubercular lesions, irrespective of the cause of death. Numerous other post-mortem examinations have shown this same startling frequency of tubercular affection among human beings. It cannot be said that all using infected milk or milk products will contract the disease, for as mentioned above, the conditions must be favorable to that contraction. It does seem reasonable to suppose, that when these conditions are favorable and the germs are present in large numbers, it is possible for the tuberculosis to be thus contracted. This is especially true of babies and children, whose digestive systems do not have the power of resistance possessed by those of older people.

While it is difficult to prove absolutely that human beings contract the disease directly from milk, actual cases have been found in which the typical bovine germs were present in children known to have consumed tuberculous milk. In Wisconsin from June 1st, 1905, to September 30, 1906, there were 3779 deaths from consumption. Of these 422 were from infection of the digestive tract, and since 60 per cent of this number were young children whose principal diet had been milk, no other conclusion can be drawn than that the cause was an infected milk supply.

Guinea pigs into which small quantities of infected milk have been injected, soon die of general tuberculosis. In the face of these facts it cannot be doubted that infected milk holds a danger for the human beings who consume it.

Tuberculosis is caused by a rod-like plant or germ which locates in the tissue of the various parts of the body, causing the formation of tubercles or round bunches of diseased tissue. These germs are about one ten-thousandth of an inch long, about ten times as long as broad. They are very slow of growth and develope fastest at the body temperature. They are not possessed of movement, but have great vitality, resisting high temperatures, freezing, moisture, drying, putrefaction, and even digestion. The germ may be killed if exposed to bright sunlight for a few hours, but will stand diffused light for a week and live in an ordinary room for months. It is killed by a temperature of 160 degrees F applied for ten minutes, but is not affected by freezing or thawing. Because of this remarkable power of resistance, they are easily disseminated with the dust in the atmosphere, are distributed with secretions on mangers and watering troughs, are carried in milk, withstanding the souring process, remain hidden in a piece of meat and survive if the meat be not thoroughly cooked. It does not absorb liquids readily, so the difficulties of disinfection are increased.

The predisposing causes of tuberculosis in cattle are those which will tend to make the body less resistant to the action of the germ. They may be grouped under two heads, breeding and hygiene. Under breeding the causes may be in-and-in breeding or breeding too young. In-and-in breeding has a tendency to intensify parental characters; if a weakness exists, the weakness becomes intensified; if a predisposition to tuberculosis exists, that predisposition becomes greater in succeeding generations. Breeding too young weakens the constitution and therefor lessens its power of resistance.

The hygiene or sanitary surroundings undoubtedly have a great deal to do with the health and vigor of animals. Dark, damp, dusty and illy ventilated barns are ideal breeding places for the tubercle bacilli and at the same time are certain to have a bad effect upon the health of the animals kept therein. It is under these conditions that the greatest number of cases are found, but is not the initial cause, merely determing the rate with which the disease spreads.

The lesions or tubercles produced by the germ can be determined only by a post-mortem examination. Wherever the germ gets a foot hold it sets up a local irritation and forms at first these minute bunches. These are the diseased tissue enclosed in a sac or capsule. They may appear on or in the lungs, the liver or the intestines and on the serous linings of the abdominal cavity. As these nodules increase in size the tissue breaks down, first into a yellowish, brown or grayish, gritty, cheesy material and then into pus which is discharged.

The disease in its earlier stages is generally located in the lymphatic system and digestive tract showing that the great source of infection was in the drink or feed. As it developes it spreads to the lungs and to all parts of the body reached by the lympathic system through which the germs travel. Germs are not found in the blood.

The symptoms of the disease are noticeable only in well developed stages and will vary according to whether the location is in the digestive system, in the lungs, or in both.

If affected in the lungs there will probably be a tendancy to a slight cough, becoming more and more hacking and violent as the disease progresses. The animal may be in first class condition physically until the last stages are reached, when emaciation takes place and a discharge may run from the nose. In intestinal tuberculosis, when the stomach, intestines and liver are affected, diarrhoea usually occurs, sudden changes in appetite are noticeable, now normal and now abnormal. As the disease progresses, emaciation or thinness increase, the hair becomes harsher and coarser and the skin less pliable and tighter over the body. The udder is affected only in the last stages ordinarily, in which case the rear glands are enlarged and hardened. The milk may be watery, sometimes thickened and may contain pus.

The symptoms become visible only in the latter stages of the disease, when the animal has become a dangerous source of infection through the distribution of tubercle bacilli in her milk or feces.

Until Dr. Koch, the great German bacteriologist, worked out what is known as the tuberculin test, some years ago, there was absolutely no reliable means of determining the presence of the disease in its earlier stages. Now in this test is found a reliable and simple method of diagnosis, one which any intelligent farmer can apply with safety. The principle of the test is the action which the tuberculin has upon tubercular tissue. The tuberculin is injected into the lymphatic system and by that diffused throughout the body. If it comes in contact with any diseased tissue it causes a fever and a corresponding rise in temperature of from 1½ to 6 degrees. It is this rise of temperature that indicates the presence of tuberculosis.

There are some who condemn the test as unreliable and dangerous, but when it is properly applied, it is as infallible as anything in human hands can be. In Pennsylvania Dr. Pearson reported, that of 4000 cases condemned by the test, only 8 failed to show evidences of the disease upon post-mortem examination. There is little danger that the test will indicate tuberculosis when it is not present. It may, however, fail to indicate it when it is actually present under four conditions. (1) When the animal has reached an advanced stage in the disease. (2) When the animal has been previously injected with tuberculin within 8 weeks. (3) When germs are in incubative period. (4) When all diseased portions have become encysted or completely surrounded by a hard fibrous tissue which seperates it from the circulation and healthy portion of the body. This surrounding tissue may break down any time and the animal be dangerously tubercular, hence the necessity of testing at least once a year.

There are many precautions to be taken in the application of the test; in the selection of animals for the test and in the conditions under which the herd is to be kept during the test. Animals should not be tested under the following conditions : (1) During the summer months while on pasture. (2) Under three months of age. (3) Cows a week before and after calving. (4) Cows in heat. (5) Animals previously tested within 8 weeks. (6) Animals in any abnormal condition due to disease, unusual excitement, etc. (7) Animals showing a temperature of 103.5 to 104 on the day previous to injection. The best time to test is during the seasons when the animals are stabled, when conditions may be kept very normal.

Treatment for the disease is impracticable. Unless the animal is a valuable breeder, the best way is to dispose of her at once, lawfully of course. A valuable cow however, may be kept in quarantine and used for years as a breeding animal. There will be little chance of her offspring taking the disease if they are taken away from her at birth and given the milk of a healthy cow or that of the dam after it has been heated to 180 degrees F for ten minutes.

Prevention is better than a cure and since curative means are unknown, to prevent is the only protection available against this disease. The means by which tuberculosis is brought into a herd is by the introduction of a tubercular animal or by the feeding of unpasteurized factory skim milk to the young stock. That such milk is dangerous is shown by the rapidity with which calves and hogs which drink it, become affected.

In order to keep a herd free from tuberculosis it is necessary to test out and dispose of, or quarantine all tubercular animals. The test must be repeated at least once a year. No animal should be introduced into the herd without a guarantee that it is free from disease. If bought without such a guarantee it should never be put with the herd until it has been tested and found free. Feed calves and hogs only pasteurized skim milk or better, have a separator on the farm and feed them what you know to be pure and uninfected. Besides taking pains to prevent the dissemination of the germs, means must be taken to increase the resisting power of the animals and also to furnish conditions unfavorable to the life of the germ.

The best means of securing both of these results, is plenty of sunlight and fresh air. No barn should be built without making provision for a large amount of sunlight and good ventilation. It is in the dark, foul aired and filthy barns where the disease spreads so rapidly. Barns should be frequently cleaned and disinfected and always very thoroughly after a tubercular animal has been removed. If these precautions are observed there is no danger but that a herd may be kept free from tuberculosis.

APPLICATION OF THE TEST

The test consists of injecting tuberculin into the lymphatic system directly under the skin, after at least three normal temperatures have been taken at intervals of at least two hours. Eight hours after injection temperatures are taken every two hours until eighteen hours after injection. If any animals show abnormal temperatures at the end of that time the readings must be continued until they fall to normal. The general rule is to consider a rise of two degrees on the second day, above the highest normal temperature of the previous day, to indicate tuberculosis, providing it reaches 104 degrees. Animals showing a rise of 1½ degrees are considered suspicious and should be retested in three or four months. The normal temperature of a cow varies normally from 101 degrees to 102.5 degrees.

PREPOTENT AND PURE BRED SIRE

A pedigree is simply a record showing the animals that have, in succession, entered into the breeding of a given individual. This record shows that the animal belongs to a distinct breed, possessing therefore, the prepotency of that breed. It furnishes a guarantee of a certain degree of individual prepotency, dependent upon the known excellency of the ancestors on each side of the pedigree, coupled with the individual excellency of the animal himself. To insure both breed prepotency and individual prepotency, the animal should be represented by a pedigree containing ancestors of known excellency, and the more frequently such names appear in the pedigree, the more valuable will the animal become and more certain his prepotency.

Grade sires, being of mixed blood, cannot transmit breed characteristics. Neither can he be relied upon to transmit his individual characteristics. The invariable rule is, that grade sires tend to destroy all desirable characteristics in the herd, while the pure bred sire tends to establish such characteristics. In short, the use of a pure bred sire tends to breed upward, whereas the use of the scrub or grade always tends downward.

If the farmer sought to breed a trotter, he would scarcely use a sire, none of whose ancestors had ever trotted. On the contrary, he would seek a sire whose pedigree showed him to be descended from the fastest ancestors possible to secure. Likewise, if he desires to raise a dairy of good cows, he should just as truly seek a sire descended through many generations of dams of known dairy excellence, and sires of recognized prepotency. This result can only be attained by the use of a pure bred sire. The use of a pure bred sire of the same breeds, for five successive generations will result in producing practically a pure bred herd, and this process is known as breeding up or grading up. The first progeny resulting from mating a pure bred sire with a scrub or native dam is, of course, a half-breed; the second cross, three-quarters; the third, seven-eighths; the fourth, fifteen-sixteenths; and the fifth, thirty-one-thirty-seconds. The fifth cross, it will be seen, possesses very little of the original blood of the native or scrub dam and is likely to have all the breed characteristics of the sires used, including color markings, conformation, temperament and dairy qualifications

The only certain way to improve the general average of our dairy cows, in capacity, uniformity and beauty, is the persistent use of a pure bred sire of the breed selected, until the native or impure blood has been obliterated.

A very serious, and frequent mistake is made, not only by dairymen, but by breeders of horses, sheep and other farm animals, in changing the breeds of the pure bred sire after several top crosses have been secured.

To illustrate: The dairyman starts with a pure bred Jersey bull, and after two or three generations have been secured, concludes that he likes the Holstein better, and straightway secures a pure bred Holstein bull. With one stroke the breeder has wiped out all the improvement which has been made. The result is neither Holstein nor Jersey, is a mixture of the two breeds, is usually inferior to either parent, is distinctly a step backward, and is a violation of the first principles of breeding. Therefore, never cross breed.

In short, successful breeding requires that the farmer shall continue with the breed first selected, and never destroy such results as he may have secured by the folly of cross breeding. The same rule applies to the breeding of every other animal on the farm.

Of course, the pure bred sires must come originally from some one who owns, not only pure bred sires but pure bred dams as well, but the dairyman, who by intelligent selection, persistent endeavor, and good treatment grades up his dairy as above outlined, will probably secure results equal to the best pure bred dairy, in so far as production goes, and increase his profits at least fifty per cent from his improved dairy.

It is a well known fact that at least one-half of the dairy cows in New York State are unprofitable; that they do not have the capacity to yield milk in sufficient quantities to pay for the feed consumed and care bestowed. Such animals should be replaced with cows of larger capacity, able to show a profit.

This improvement certainly cannot be secured by purchase of new stock, because every dairyman would naturally wish to sell his unprofitable stock and keep those that show a profit; and while there might be, and actually is, a never ending exchange of animals, still the percentage of failures remain just the same throughout the state. The remedy must come through improvement in breeding, and this can only come by the use of the best obtainable pure bred sire.

BARNYARD MANURES: THEIR COMPOSITION AND USE ON VARIOUS SOILS FOR VARIOUS CROPS

MANURES A VALUABLE RESOURCE OF THE FARM

One of the most essential elements in successful farming is the proper use of the by-products that necessarily come in the process of keeping and feeding livestock. These have too commonly been considered waste products, but it is a fact that if properly handled and used, they would represent a large part of the profit to be had from stock raising. We cannot continue to take money out of the soil in the form of crops unless we put back the essential elements that we remove; no more could we continue to take money from our pocket without replenishing it.

The best source from which to recoup the diminishing fertility of our soil is the barnyard manure pile, because it is putting back in part just what has been taken off, and because it is in a form easily made available by the provisions of Nature and the least expensive, and at the same time, most valuable for all ordinary purposes of all fertilizers, commercial or otherwise. The winter production of manure on a small farm, say one carrying 4 horses, 20 cows, 50 sheep, and 10 pigs, will amount to $250 if properly kept, and should be considered as a regular income on the farm, for this judiciously applied from year to year will keep up a fair grade of fertility for generations.

There are several important conditions that make barnyard manures variable in the composition and value. These are, (1) age and kind of animal, (2) quantity and quality of food, (3) proportion and kind of litter, (4) method of management and age of manure.

Upon the age and kind of animal depends the proportions of Potassium, Phosphorous and Nitrogen recovered in their manures. Full grown animals excrete practically all these fertilizing constituents consumed. Young growing stock and milch cows will excrete only from 50 to 70 per cent, and fattening animals 90 to 95 per cent. In the case of young stock less Phosphorous is excreted and of milch cows less Nitrogen. The variation of the fertilizing elements in the manure of the different animals will be noted in their composition tables.

The fertilizing constituents of the manure must vary directly as those of the given foods, and the more food consumed the more is excreted.

The following table shows the fertilizing value of the more common feeding stuffs:

	Value of N in 1 ton	Value of Phos. in 1 ton	Value of Pot. in 1 ton	Total Fert. value 1 ton
Corn meal	$ 4.53	$ .83	$ .31	$ 5.66
Corn silage	78	.14	.32	1.24
Red clover hay	5.70	.54	1.31	7.55
Timothy hay	3.00	.43	1.17	4.60
Cotton seed meal	20.85	3.66	1.65	26.16
Meat scrap	29.01	6.01	.67	35.69
Wheat	7.08	.96	.45	8.49
Oats	5.36	.90	.45	6.70
Skim milk	1.74	.26	1.08	2.11
Wheat bran	7.56	3.40	1.34	12.30
Wheat straw	81	.30	1.02	2.18
Turnips	48	.14	.34	.96

The litter must necessarily decrease the value of the manure per ton for it will be comparitively poor in fertilizing constituents. It is very important however in the absorbtion of the liquid excrement and controls to some extent the decomposition of the manure.

The following table shows the per cent. of the fertilizing constituents in litters:

	N	Phos.	Pot.
Dead leaves	16	6	6
Straw	8–12	4–6	12–32
Peat moss	16	Trace	Trace
Saw dust	4–14	6	14
Peat	20–40	....	....

The management of barnyard manure has a great influence on its final composition for it is a material that undergoes rapid changes, but it is too large a subject to be undertaken in this brief topic. The following table however shows the loss sustained during six months exposure to the weather by manure well stacked in a compact pile:

	April	Sept.	Loss
			per cent
Total weight	4000	1730	57
	per cent	per cent	
Nitrogen	19.60	7.79	60
Phosphorous	14 80	7.79	47
Potassium	36 00	8.65	76
Value per ton	$ 2.80	$ 1.06	.60

Analyses and value of different animal manures containing just enough litter to keep animal clean:

	Lbs. per year		Water per cent	Nitrogen per cent	Phos. per cent	Potassium per cent	Value per ton
	Solid	Liquid					
Cows	20000	8000	75.25	0.426	0.290	0.440	$ 2.02
Calves			77 73	0.497	0.172	0.532	2.18
Horses	12000	3000	48.69	0 490	0 260	0.480	2.21
Pigs	1800	1200	74.13	0.840	0.390	0.320	3.29
Sheep	760	380	59.52	0.768	0.391	0.591	3.30
Hen			56.00	.80–2.0	.50–2.0	0.80–.90	7.07

The above table is supposed to give the total amount and value of the fertilizing constituents of both these parts. As a matter of fact in the ordinary care given manure much of the liquid is lost and the value greatly decreased. The urine from animals is by far the most valuable part of their excreta; nine-tenths of the Phosphorus goes to the solid, but of the most valuable constituent Nitrogen, from ⅔ to ¾ goes to the liquid excreta or urine.

The following table shows the relative amounts in the solid and liquid excreta and will impress one with the importance of the careful preservation of the liquid part of manures.

	per cent water		per cent nitrogen		per cent phos.		per cent pot. & sodium	
	Solid	Liquid	Solid	Liquid	Solid	Liquid	Solid	Liquid
Horses......	76	89.0	0.50	1 20	0.35	trace	0.30	1.5
Cows.......	84	92.0	0 30	0.80	0.25	trace	0. 10	1.4
Swine	80	97.5	0.60	0.30	0.45	0.125	0.50	0 2
Sheep	58	86.5	0.75	1.40	0.60	0.050	0.30	2.0

As to whether the manure should be applied in a fresh or well rotted condition depends chiefly upon the soil upon which it is to be put. Well rotted manure is more quickly available to the plant, less bulky, easier to handle and less likely to produce rank growth. On the other hand fresh manure ferments readily in the soil and in the process the constituents of the manure are not only made available but also some of those in the soil.

If the improvement of the mechanical condition of the soil is the object, it can best be done by the application of fresh manures with their litter to the heavy clay soils and the well rotted to the light sandy soils. If the fertilizing value and ready action of the constituents is the object, coarse and fresh manures are best used on the light, and the well rotted on the heavy soils. The reason for this is that the open texture of the light soils allows quick bacterial action or fermentation because of the presence of sufficient oxygen; in clay soils however the fermentations must necessarily be slow because of the poor air circulation. On clay soils many times no effect is noticed during the first year because of slow decomposition, but the fertilizing constituents are absorbed and retained and finally used by the succeeding crops. On light soils it is better to make small applications of well rotted manure frequently because otherwise the soluble fertilizing constituents might be carried off by the drainage before they can be used by the plant.

The application of manures should be regulated by the crop to be raised as well as by the soil. A direct application is injurious to the quality of tobacco, sugar beets, potatoes and all root crops with the exception of mangels, which appear to thrive wonderfully upon it. Manure should be applied to the previous crop or at least put on in the fall and allowed to rot during the winter before planting in the spring, in these cases. Wheat is benefited by direct application only on light soils; on heavy soils it is best to apply it to the previous crop. This rule will apply generally to all cereal crops. Fresh manure directly applied has a forcing effect and is better suited to grasses and forage crops, than to seed plants such as cereals.

The amount, rate, and condition of manure to be applied to any soil must be determined largely by the mechanical composition of the soil, by climatic conditions, and by the crop to be grown.

First Year Enrollment, 1909--1910

Regular 3-year course	46
Specials electing only part work	41
Specials in Short Course in Dairying	40
Total enrollment	127

School Calendar, 1910-1911

Registration Day	Oct. 17, 1910
School work begins	Oct. 18, 1910
Christmas Recess begins	Dec. 22, 1910
School work begins	Jan. 2, 1911
First term closes	Jan. 13, 1911
Second term begins	Jan. 14, 1911
Second term closes	Apr. 7, 4:30 P. M.

New York State School of Agriculture

Introduction. The school opened for the first regular year, October 18, 1909. In 1908, $75,000 was voted by the Legislature to buy a farm, erect necessary buildings and provide equipment. In 1909, an appropriation of $40,000 was voted for additional buildings and equipment, since the School building and the barn alone cost respectively $42,000 and $20,000. The State provided $20,000 for the annual maintenance for the year, 1909--10 and will doubtless do equally well or better for 1910--11.

Object. The object of the School is to prepare boys and girls, young men and young women who are thoroughly acquainted with country life conditions, to lead successful and happy lives in the country, whether as farmers, farm managers or teachers in rural schools.

Admission. Students who are 14 or 15 years of age will be admitted if they have completed the common school course or the work of the eight grades of a city school. Students 16 years of age or older, will be admitted without such preliminary preparation, provided they can satisfy the Director of the School that they can intelligently and profitably pursue the course which they elect. Students upon applying should be in good health, have had some practical experience on the farm and be of good moral character.

Free Tuition. Tuition is free to students who have lived in New York state one year prior to entering the School. Living expenses are exceptionally moderate—$100 to $125 a year. Limited dormitory facilities at moderate prices for both young men and young women have been provided.

School Year. The school year consists of two terms, each of twelve weeks duration. The school opens for its second year Oct. 17, 1910, and closes April 7, 1911. The only vacation given is at Christmas.

Farmers' Week. An Institute for the practical farmers will be held in January or February. Send for program.

Alfred. The village of Alfred is composed of hard-working people of high moral character. There has never been a saloon in Alfred. Alfred University, Alfred Academy, the State College of Clay-Working and Ceramics along with the State School of Agriculture, all conspire to make Alfred the educational center of South-Western New York State.

Self Support. There is opportunity for students so desiring, to earn a part of their expenses through waiting on table, working about the school and on the farm, and doing odd jobs about the college and in the village. This year and next spring and summer there will be building and grading in progress on the school and farmstead sites, hence there will be unusual opportunity for those students who are ready to turn their hands to account in this way. The enterprising and capable young man or young woman who attends the school will be able to lower, materially, the cost as set down above.

Domestic Science. Especially elaborate provisions have been made for the teaching of Domestic Science and Household Arts. One entire floor of Agricultural Hall is given over to this department. Miss Angeline Wood, the head of the department, is a graduate of Pratt Institute and has for five years been the professor of Domestic Science and Economy in the Dunn County (Wis.) School of Agriculture and Domestic Economy. Her success in all her work has been unqualified.

Faculty. Nine instructors assist in the teaching. These persons all are especially prepared through wide experience and through having taken collegiate courses in their specialties.

Special Courses

For those students who cannot complete the regular course, and can stay for but one, two or more terms, the best possible selection of studies and practice work will be arranged with a view to using to the best advantage the time that can be spent in the school. If you cannot enter for the regular course, or for even one year of the regular course, but can get away from the farm for a month or two, come to the School and a course will be arranged for you, to the end that you may have your part in this state school.

Course of Study

First Year

TERM I

BOYS		BOYS AND GIRLS		GIRLS	
Dairy Husbandry	4			Cooking I	3
Forge Work	5			Sewing I	2
Cement Work	1			Drawing I	2
				General Agr.	3
		Botany	3		
		Physics	3		
		Arithmetic	2		
		English I	3		

TERM II

Breeds	4			General Agr.	3
Drawing	4			Cooking II	2
				Sewing II	3
				Laundry	1
		Chemistry I	3		
		Hygiene	3		
		Farm Accounts	2		
		English II	4		
		Rural Sociology	1		

Second Year

TERM III

Farm Crops	5			Cooking III	3
Woodworking I	4			Sewing III	2
Farm Surveying	2			Drawing II	3
				Millinery I	2
		Butter Making	3		
		Chemistry II	3		
		English III	3		
		Poultry	2		

TERM IV

BOYS		BOYS AND GIRLS		GIRLS	
Climate & Soil Studies	5	Cheese Making	3	Cooking IV	2
Woodworking II	4	General History	3	Sewing IV	3
Stock Judging	2	English IV	2	Millinery II	1
Fertilizers	2			Food Studies	3
Poultry	2			Woodworking	2

Third Year

TERM V

Forestry	2	Plant Diseases	3	Cooking	2
Feeds and Feeding	4	Gardening	2	Sewing	3
Breeding	3	General History	5	Home Nursing	3
Creamery Practice	2			Food Adulteration	1
Farm Machinery	2			Household Bact'gy	1

TERM VI

Orcharding	3	Insect Pests	3	Cooking	2
Dressing and Curing Meats	1	Landscape Gardening	2	Sewing	2
Veterinary Studies	3	Civics	2	Home Sanitation	2
Farm Building	4	Farm Law	1	Home Decoration	2
Farm Management	2			Art Needlework	2
				Household Management	2

NOTE.—The figures after all the studies indicate how many times each week during the term, classes are called in the various studies.

Address all inquiries concerning entrance, etc., to

O. S. MORGAN, Director,
Alfred, N. Y.

APPLICATION FOR ADMISSION
to the
STATE SCHOOL OF AGRICULTURE
at Alfred University, Alfred, N. Y.

....1910

1. Name... Age..............
2. Postoffice .... County ....
3. Name of Parent or Guardian........................ ....
4. How far advanced are you in the following studies:
   - Science.................................. ....
   - Mathematics........ ....
   - Geography ....
   - History ....
   - Reading........... ....
   - Grammar or Rhetoric ....
5. Have you good health?..
6. How much money will you have to earn to stay in School 6 months?

....

Brief remarks may be added on the other side of this blank.

Do not make out this blank unless you fully expect to come.

If you can come for the first term, opening October 17th, plan to arrive at Alfred on Monday forenoon.

Send in this application as early as possible, so that ample boarding accommodations can be arranged for.

O. S. MORGAN, Director,
Alfred, N. Y.

3 0112 105611401